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| 09/877,249 | 06/11/2001 | Stanley John Becker | 608-297 | 7974 |

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NIXON & VANDERHYE, PC
1100 N GLEBE ROAD
8TH FLOOR
ARLINGTON, VA 22201-4714

| EXAMINER | |
|---|---|
| LEUNG, JENNIFER A | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1764 | |

DATE MAILED: 07/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/877,249 | BECKER ET AL. | |
| | Examiner | Art Unit | |
| | Jennifer A. Leung | 1764 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *28 May 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1,2,5-7,10-16,18-20,47,48,51-60 and 62-64* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,5-7,10-16,18-20,47,48,51-60 and 62-64* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Response to Amendment*

1. Applicant's request for reconsideration of the finality of the last Office action, filed May 28, 2004, is persuasive and, thus, the finality of that action is withdrawn. Claims 3, 4, 8, 9, 17, 21-46, 49, 50, 61 and 65 have been cancelled. Claims 1, 2, 5-7, 10-16, 18-20, 47, 48, 51-60 and 62-64 remain active.

### *Response to Arguments*

2. Applicant's arguments with respect to the rejection of claims 1, 2, 5-7, 10-16, 18-20, 47, 48, 51-60 and 62-64 under 35 U.S.C. as being unpatentable over Kittleson et al. in view of Chowdhury et al. (and in further view of additionally cited references) have been considered and are persuasive. Thus, said rejections are withdrawn. However, upon further consideration, new grounds of rejection are made in view of newly found prior art references, below.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1, 2, 5, 10, 11, 19, 20, 47, 48, 54, 55, 63 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collin et al. (US 4,084,958) in view of Collin et al. (US 4,374,663). [Hereinafter, referred to as Collin '958 and Collin '663, respectively].

Regarding claims 1 and 47, Collin '958 (FIG. 1, 2; column 2, line 48 - column 4, line 12) discloses an apparatus for conducting iron oxide reduction, said apparatus comprising a fluidized bed reactor (i.e., reactor chamber **1** or **10/11/12**) comprising a grid (i.e., although not illustrated in FIG. 2, reactor chamber **10/11/12** suitably comprising a conventional, equivalent, gas-distributing bottom **2**, as shown for reactor **1** in FIG. 1) and into which reactor there extend more than one inlet pipes for an oxygen-containing gas (i.e., air supplied through a number of small nozzles **15**; FIG. 2). Collin '958, however, is silent as to the inlet pipes **15** having surround means for surrounding a substantial portion of said pipes with a sealed, inert fluid.

Collin '663 teaches a similar apparatus for conducting the reduction of iron oxide, said apparatus comprising a fluidized bed reactor **41** (FIG. 3; column 3, lines 36-60) having a plurality of nozzles **46** that extend into the fluidized bed reactor **41**, for the introduction of an oxygen-containing gas therein (i.e., combustion air). Additionally, Collin '663 teaches that each nozzle **46** may be constructed according to the types disclosed in FIG. 1 or FIG. 2 (column 2, line 58 - column 3, line 35), wherein each nozzle comprises an inlet pipe for the oxygen-containing gas (i.e., gas supply pipe **4**) and a surround means for surrounding a substantial portion of the inlet pipe with a sealed, inert fluid (i.e., jacket **7**, containing cooling medium **5**).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to substitute the nozzles as taught by Collin '663 for the nozzles **15** of the apparatus of Collin '958, on the basis of suitability for the intended use, because the provision of nozzles

having surround means prevents the sticking and agglomeration of iron oxide to the surfaces of the nozzles, which can undesirably disturb the fluidized bed function (Collin '663; column 1, line 47-68; column 2, lines 1-19).

Regarding claims 2 and 48, Collin '663 further teaches, by illustration, at least 85% of the inlet pipes **4** in the reactor being surrounded by surround means **7** (see FIG. 1, 2).

Regarding claims 5 and 51, the collective teachings of Collin '958 and Collin '663 teach surround means 7 is provided with a supply of inert fluid (i.e., cooling medium **5** supplied by pipe **6**) and comprises one or more outer pipes surrounding a substantial portion of inlet pipes **4** in said reactor (i.e., a plurality of nozzles **15** are shown in FIG. 2 of Collin '958, thereby indicating a plurality of surround means in the modified apparatus; also, the nozzles may comprise plural outer pipes as defined by jacket **7** and wall **17**, shown in FIG. 2 of Collin '663).

Regarding claims 10, 11, 54 and 55, the apparatus of Collin '958 inherently comprises means for suppressing ingress of reactants into the inlet pipes **15**, wherein said means comprises providing oxygen containing gas in the inlet pipes **15** at a pressure higher than the pressure in the reactor **10/11/12**. This is evidenced by the fact that air is being "supplied to" the reactor. See column 3, lines 25-29. (i.e., if the supply of oxygen containing gas to inlet pipes **15** was at a pressure lower than the pressure in the reactor **10/11/12**, the flow of gas would be in reverse).

Regarding claims 19 and 63, Collin '958 illustrates the oxygen-containing gas being supplied to inlet pipes **15** via a common end box having inventory (i.e., a supply manifold, not labeled; FIG. 2). Similarly, Collin '663 illustrates the oxygen-containing gas being supplied to inlet pipe **4** via a common end box having inventory (i.e., supply line **3** containing molecular oxygen, comprising an annular conduit surrounding reactor **41**; FIG. 1, 3; column 2, lines 58-64).

Regarding claims 20 and 64, Collin '958 discloses "the gas is partially combusted together with the solid carbonaceous material by air supplied through a number of small nozzles **15**, thus generating *sufficient heat for reaction*," (column 3, lines 25-29). Similarly, Collin '663 teaches that, "Preheated air was supplied through the nozzles **46** at *a rate required for producing the heat of reduction and for maintaining, by partial combustion of the coal, a temperature of 970 °C in the reactor*," (column 4, lines 56-59). However, Collin '958 and Collin '663 are silent as to the nozzles being operably connected with "flow restriction means". In any event, such control elements would be inherent of the apparatus of Collin '958, as well as the apparatus of Collin '663, as evidenced by both apparatus having the ability to vary and maintain a sufficient rate of air supply, and hence, a sufficient reaction temperature. Also, it would have been obvious for one of ordinary skill in the art at the time the invention was made to provide flow restriction means to the nozzles in the modified apparatus of Collin '958 because the provision of fluid control means, such as flow restrictions, for enabling the regulation of a feed rate to a reactor is well known in the art.

4. Claims 7 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collin et al. (US 4,084,958) in view of Collin et al. (US 4,374,663), as applied to claims 1 and 47 above, and further in view of Takeuchi et al. (JP 55-36673).

The collective teachings of Collin '958 and Collin '663 are silent as to the apparatus further comprising a means for detecting a change in pressure of the inert fluid surrounding the inlet pipes. Takeuchi et al. (Abstract; Figure) teach a double-tube pipeline comprising an inner tube **1** and an outer tube 2, wherein the pipeline comprises means for detecting a change in pressure of the fluid **b** located in the annular region between pipes **1** and **2** (i.e., in the case of a

detected leakage) and thereby increasing the pressure of the fluid **b** such that it diffuses into the fluid **a** being conveyed by inner pipe **1**. It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide a means for detecting a change in pressure of the inert fluid to the surround means in the modified apparatus of Collin '958, on the basis of suitability for the intended use, because the pressure change detecting means would enable the detection of a leak within the inlet pipes and enable the signal for the diffusion of the conveyed fluid upon detection of the leakage, as taught by Takeuchi et al.

5. Claims 6, 12-16, 52 and 56-60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collin et al. (US 4,084,958) in view of Collin et al. (US 4,374,663), as applied to claims 1 and 47 above, and further in view of Stephan et al. (US 3,411,716).

Regarding claims 6 and 52, the apparatus of Collin '958 is operated under high temperature conditions (i.e., upwards of 900 °C; column 2, lines 39-47), with the nozzles being cooled to a substantially lower temperature (see Collin '663; column 4, lines 56-62). However, Collin '958 is silent as to the apparatus comprising differential expansion means for the inlet pipes and surround means. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to provide means for allowing differential expansion of the inlet pipes and the surround means in the modified apparatus of Collin '958, on the basis of suitability for the intended use, because the provision of thermal expansion means to the pipes of high-temperature reaction apparatus is well known in the art, as evidenced by Stephan et al., who teaches, "Lances for oxygen steelmaking converters and other furnaces are commonly *mounted for axial movement* over a vertical path to an from an operative blowing position and usually have a nozzle with a single axially extending orifice therein." (column 1, lines 36-41).

Regarding claims 12, 13, 56 and 57, Collin '958 and Collin '663 are collectively silent as to the inlet pipes comprising ingress suppression means in the form of a restriction to the outlet of the inlet pipe. Stephan et al. teach a water-cooled oxygen injection nozzle (FIG. 1, 3; column 2, lines 41-69) comprising an inlet pipe **1** that is surrounded by a water-cooling jacket defined by concentric pipes **4** and **5**. Additionally, the inlet pipe **1** comprises a restriction to the outlet of the inlet pipe **1** (i.e., plug **15** with control pipe **20**; FIG. 3, 4), the restriction further defining an orifice (i.e., a venturi orifice defined by insert **23**). It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide a restriction to the outlet of the inlet pipe in the modified apparatus of Collin '958 because the oxygen distributing action of the nozzle is enhanced by the axial jet of oxygen projected centrally thereof from the orifice of the restriction, as taught by Stephan et al. (column 3, lines 3-17).

Regarding claims 14, 15, 58 and 59, although the collective teachings of Collin '958, Collin '663 and Stephan et al. are silent as to the restriction being located at the specifically recited locations, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate location for the restriction in the modified apparatus of Collin '958, on the basis of suitability for the intended use, since shifting location of parts was held to have been obvious, and where the general conditions of a claim are disclosed in the prior art, discovering optimum or workable ranges involves only routine skill in the art.

Regarding claims 16 and 60, the restrictions would inherently be located within a region of the inlet pipes **15** surrounded by the surround means in the apparatus of Collin '958, as modified by Collin '663, above.

6. Claims 18 and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collin et al. (US 4,084,958) in view of Collin et al. (US 4,374,663), as applied to claims 1 and 47 above, and further in view of Wagner et al. (U.S. 5,801,265).

The collective teachings of Collin '958 and Collin '663 are silent as to the distance between the inlet pipes being significantly in excess of the potential flame length. Wagner teaches a reactor **36** comprising oxygen gas inlets **60**, wherein the inlets **60'**, **60"** are positioned such that the distance **D** between inlets **60'**, **60"** is significantly in excess of a potential flame length (FIG. 3; column 4, lines 15-38). It would have been obvious for one of ordinary skill in the art at the time the invention was made to configure the inlet pipes at a distance significantly in excess of the potential flame length in the modified apparatus of Collin '958, on the basis of suitability for the intended use, because such arrangement provides an improved system for introducing oxygen containing gas that avoids explosions, deflagration, or other anomalous process conditions, as taught by Wagner (column 2, lines 13-18). In any event, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art.

7. Claims 1, 2, 5, 6, 10-16, 19, 20, 47, 48, 51, 52, 54-60, 63 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Marshall Jr. (US 2,654,658) in view of Collin et al. (US 4,084,958).

Regarding claims 1, 5, 47 and 51, Marshall Jr. (FIG. 1, 2) discloses an apparatus comprising a fluidized bed reactor **10** comprising a fluidization means (i.e., inlet lines **13** extending through the bottom **12** of vessel **10**, connected with outside manifold **14**), and into which reactor **10** there extend a plurality of inlet pipes (i.e., lines **30**, **31**, **32**), in which said pipes

have a plurality of surround means for surrounding a substantial portion for said pipes in said reactor with a sealed, inert fluid (i.e., circulation of cooling liquid is shown adjacent to pipe **28** and inside of casing **34**, for example; FIG. 4). Marshall Jr. is silent as to the fluidization means **12/13/14** comprising a fluidization grid, but further discloses, "The introduction of the aeration fluid may be effected in any manner which provides adequate aeration of the mass of solids" (column 3, lines 22-24). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to substitute another suitable fluidization means, such as the instantly recited grid, for the fluidization means of Marshall Jr., on the basis of suitability for the intended use, because fluidization grids are well known in the art, and it has been held that the substitution of known equivalent structures merely involves ordinary skill in the art. Collin et al. further evidences the conventionality and equivalency of the above types of fluidization means (i.e., a grid **2** in FIG. 1; a plurality of inlet lines, not labeled, extending through the reactor bottom **12** and connected to an outside manifold, not labeled, in FIG. 2).

Regarding claims 2 and 48, Marshall Jr. discloses, "pipe **28** leading to nozzle **29** and in contact with hot catalyst may be enclosed within an outer cylindrical casing **34** which is closed at the end adjacent nozzle **29**," (column 5, lines 28-32). Referring to FIG. 2, it is seen that surround means **34** would inherently cover at least 85% of the inlet pipe **30**, **31**, **32** to the reactor **10**.

Regarding claims 6 and 52, Marshall Jr. discloses means for allowing differential expansion of the inlet pipes and the surround means (as shown in FIG. 2, conduits **30**, **31**, and **32** have bends at their outlets).

Regarding claims 10, 11, 54 and 55, the apparatus of Marshall Jr. inherently comprises means for suppressing ingress of reactants into the inlet pipes **30, 31, 32**, wherein said means

comprises providing gas in the inlet pipes **30, 31, 32** at a pressure higher than the pressure in the reactor **10**. This is evidenced by the fact that air is being "supplied to" the reactor. (i.e., if the supply of gas to inlet pipes **30, 31, 32** was at a pressure lower than the pressure in the reactor **10**, the flow of gas would be in reverse).

Regarding claims 12, 13, 56 and 57, Marshall Jr. discloses the apparatus comprising ingress suppression means in the form of a restriction to the outlet of the inlet pipe, said restriction having one or more orifices (i.e., as illustrated in FIG. 4, tube **28** narrows at its upper end, creating a restriction, and then communicates with a plurality of orifices in nozzle **29**).

Regarding claims 14-16 and 58-60, although the Marshall Jr. silent as to the restriction being located at the specifically recited locations, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate location for the restriction in the modified apparatus of Marshall Jr., on the basis of suitability for the intended use, since shifting location of parts was held to have been obvious, and where the general conditions of a claim are disclosed in the prior art, discovering optimum or workable ranges involves only routine skill in the art.

Regarding claims 19, 20, 63 and 64, Marshall Jr. discloses the inlet pipes **30**, **31**, **32** being provided from a common end box having inventory (i.e., a manifold, defined by pipe portion **31**), wherein each of the inlet pipes is operably connected to the gas supply through one or more flow restriction means (i.e., the valves located in lines **30**, **31**, **32**, not labeled; FIG. 2).

***Conclusion***

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Sands is provided to further illustrate a conventionally known means for detecting a change in pressure of an inert fluid located in a cooling jacket of an oxygen supply pipe, i.e., in cases of leakage.

* * *

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is (571) 272-1449. The examiner can normally be reached on 8:30 am - 5:30 pm M-F, every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer A. Leung
June 28, 2004

Hien Tran

HIEN TRAN
PRIMARY EXAMINER